



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester, B.E. - Semester End Examination; Dec - 2017/Jan - 2018

Engineering Mechanics

(Common to All Branches)

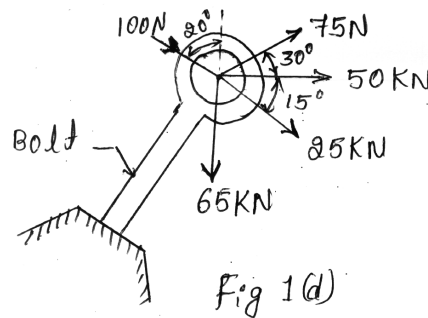
Time: 3 hrs

Max. Marks: 100

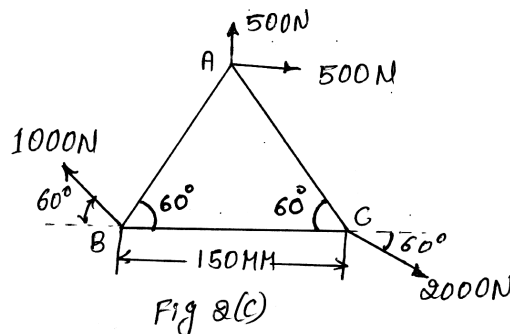
Note: Answer FIVE full questions, selecting ONE full question from each unit.

UNIT - I

- 1 a. Explain briefly basic idealization in mechanics. 4
- b. Define force system. List and explain system of forces. 7
- c. Define; 3
 - i) Transmissibility of force
 - ii) Principal of super position.
- d. Five forces are acting on a bolt as shown in Fig. 1(d). Determine the resultant of the forces on the bolt.



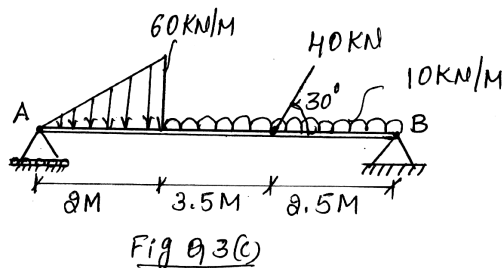
- 2 a. Define; 7
 - i) Couple and its characteristics
 - ii) Resultant
 - iii) Equilibrant.
- b. State and prove Varginons theorem. 6
- c. Determine the resultant and equilibrant of the forces acting as shown in Fig. 2(c).



UNIT - II

- 3 a. Explain the different types of supports in the analysis of beams. 6
- b. Explain briefly with neat sketch different types of loads. 6

c. Find the support reactions for the beam loaded as shown in Fig. Q3(c).



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4 a. Define the following:

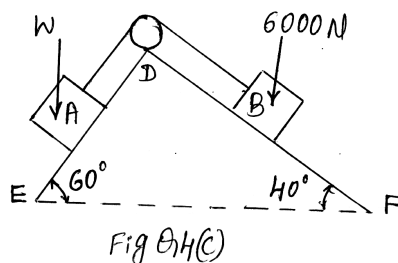
- i) Angle of friction
- ii) Angle of repose
- iii) Coefficient of friction.

6

b. Explain laws of dry friction.

6

c. Two blocks A and B are tied by a string passing over a frictionless pulley as shown in Fig. Q 4(c). The co-efficient of friction for planes DE and DF are 0.2 and 0.25 respectively. Find weight of block A for moving up the plane AB.



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UNIT - III

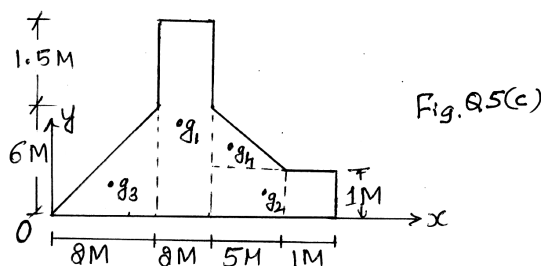
5 a. Define; i) Centre of gravity ii) Axis of reference.

4

b. Determine the centroid of a triangle by method of integration.

7

c. Locate the centroid of area as shown in Fig. Q5(c) with respect to the Cartesian coordinate shown.



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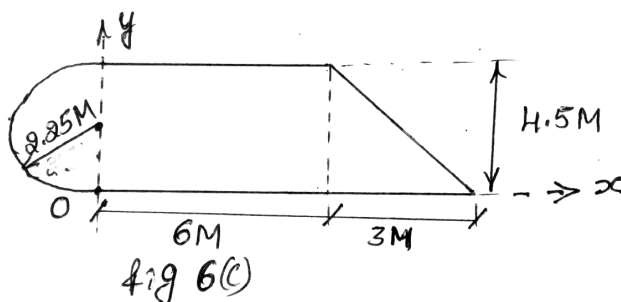
6 a. Derive an expression for centroid of a semi-circle?

6

b. Obtain expressions for centre of gravity of a plane figure.

4

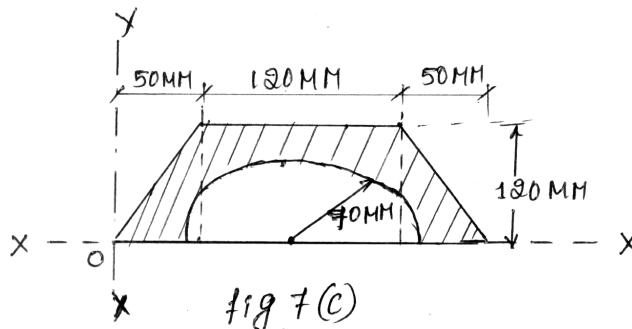
c. Locate the centroid of the area shown in Fig. Q6(c) with respect to the axis.



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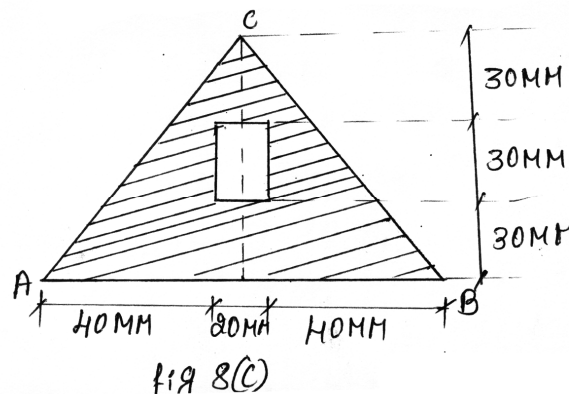
UNIT - IV

- 7 a. Define; i) Moment of inertia ii) Radius of gyration. 4
 b. State and prove parallel axis theorem. 6
 c. Determine the M.I about the horizontal centroidal axis and also find the radius of gyration about the horizontal centroidal axis shown in Fig. Q7(c).



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- 8 a. Define Polar moment of inertia. 2
 b. Determine the M.I of triangle of base width 'b' at a height 'h' about the base. 8
 c. Determine the M.I. and radii of gyration of the area shown in Fig. Q8(c) about the base AB and the centroidal axis parallel to AB.



10

UNIT - V

- 9 a. Explain with a sketch the following terms in projectile motion; 7
 i) Range ii) Time of flight
 iii) Maximum Height iv) Angle of projection.
 b. A projectile fired at certain angle with the horizontal has a horizontal range 3.5 km. If the maximum height reached is 500 m, what is the angle of elevation of the canon? What is the muzzle velocity of the projectile? 7
 c. A wheel rotating about a fixed axis at 20 rpm is uniformly accelerated for 70 seconds, during which time it makes 50 revolutions. Determine; 6
 (i) Angular velocity at the end of this interval
 (ii) Time required for the speed to reach 110 rpm.

- 10 a. What is super elevation and benefits of providing the super elevation? 6
- b. A particle falling vertically under the action of gravity passes two points 10 m apart in 0.2 s. Find the height from which the particle did start to fall above the higher point. The initial velocity of the particle is zero. 7
- c. A cricket ball is thrown by a fielder in the ground from a height on 3 m at an angle of 40° with horizontal. The velocity with which the ball is thrown is 30 m/s. The ball hits the wicket at a height of 0.3 m from ground. Determine the distance of the fielder from the wicket when the ball is thrown. 7

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